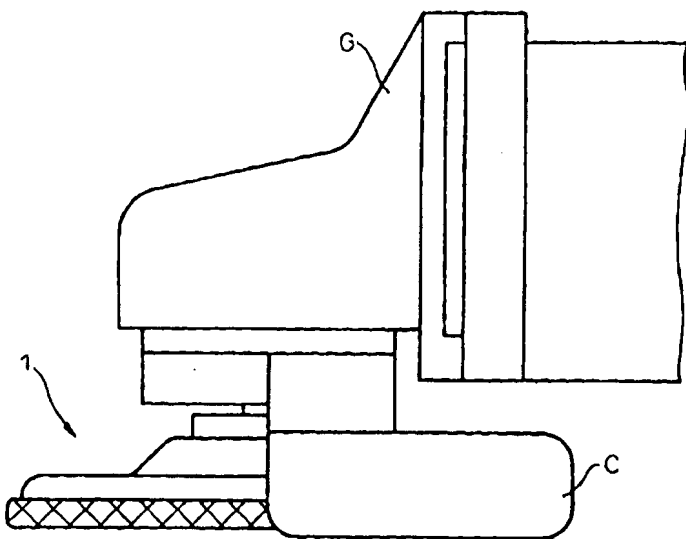




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/US97/12260 <b>(22) International Filing Date:</b> 10 July 1997 (10.07.97)  <b>(30) Priority Data:</b> 8/191001                      19 July 1996 (19.07.96)                      JP  <b>(71) Applicant (for all designated States except US):</b> MINNESOTA MINING AND MANUFACTURING COMPANY [US/US]; 3M Center, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).  <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only):</b> NAGAFUCHI, Naohiro [JP/JP]; 5-3, Hashimoto 5-chome, Sagamihara-City, Kanagawa Pref. 229-11 (JP).  <b>(74) Agents:</b> TRUSSELL, James, J. et al.; Minnesota Mining and Manufacturing Company, Office of Intellectual Property Counsel, P.O. Box 33427, Saint Paul, MN 55133-3427 (US).		<b>(81) Designated States:</b> BR, CA, CN, KR, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> DISK HOLDER  <div style="text-align: center;">  </div>		
<b>(57) Abstract</b>  <p>To provide a compact disk holder which is superior in strength and at the same time can completely fit in existing covers. A disk holder (1) including an internal threaded portion (15) into which is able to be screwed an external threaded portion for attaching the disk holder to a disk grinder (G), a holding surface (5) able to hold by a planar fastener (11) a circular abrasive sheet (79) having a center hole, and a projection (7) for passing through and engaging with the center hole of the held abrasive sheet (79) and further able to prevent detachment of the abrasive sheet, wherein said projection (7) is formed by a metal, said holding surface (5) is formed by a plastic, and said internal threaded portion (15) is formed in said projection (7) so that the dimension of the disk holder (1) in the thickness dimension is reduced.</p>		

## DISK HOLDER

### TECHNICAL FIELD

5 The present invention relates to a disk holder to be attached instead of the normally attached grinding wheel to the grinding wheel shaft of a pneumatic or electric portable disk grinder and having a holding surface for holding a circular sheet-like abrasive.

### BACKGROUND OF THE INVENTION

10 In the past, disk grinders have been widely used as grinding tools with thick disk-like grinding wheels. Due to the heavy grinding performance, a special compact cover whose shape and dimensions are set down by law in some jurisdictions, has been attached to cover the half of the side of the grinding wheel facing the worker.

15 On the other hand, this disk grinder has been widely used for relatively light grinding work such as grinding of wood as a so-called "sander" (simple grinding tool) screwed in with a plastic disk holder 65 having insert molded at a center boss portion a metal bush 63 forming the internal threaded portion 61 at its axis of rotation as shown in Fig. 6(a) and holding at a disk surface (holding surface) 67 at  
20 the bottom of the disk holder 65 a circular abrasive sheet (for example, sandpaper) by a planar fastener 71. In use, the abrasive sheet 69 relatively easily comes off from the disk holder 65, therefore the applicant has supplied to the market a new type of disk holder 85 provided with a projection 81 for engaging with the center hole 77 of a new type of abrasive sheet 79 having this hole 77 as shown in Fig. 6(b)  
25 as an improved version of this (see for example, Japanese Unexamined Utility Model Publication (Kokai) No. 7-15732).

As shown in Fig. 7, both the new and old types of disk holders 65 and 85 used when using the disk grinder G as a sander feature large dimensions in the thickness direction A, so end up sticking out from the compact cover C. This is not  
30 preferable.

In an attempt to solve this problem, it may be considered just to reduce the dimensions of the conventional disk holders 65 and 85 in the thickness dimension. However, in the case of the old type (Fig. 6(a)), there is a certain minimum dimension in direction A of the total of the bush 63 and the abrasive sheet 69, while  
5 in the case of the new type (Fig. 6(b)), the bush 63 would extend into the projection 81 which engages the abrasive sheet, and therefore that portion of projection 81 would become extremely weak. In both cases, there would be a problem.

#### SUMMARY OF THE INVENTION

10 Therefore, in the present invention, an attempt is made to solve the problems from a new perspective. The object is to provide a compact disk holder which can fit in the existing compact covers of disk grinders.

To solve the above problems, the present invention provides a disk holder including an internal threaded portion into which is able to be screwed an external  
15 threaded portion for attaching the disk holder to a disk grinder, a holding surface able to hold by a planar fastener a circular abrasive sheet having a center hole, and a projection for passing through and engaging with the center hole of the held abrasive sheet and further able to prevent detachment of the abrasive sheet, wherein said projection is formed by a metal, said holding surface is formed by a plastic, and  
20 said internal threaded portion is formed in said projection so that the dimension of the disk holder in the thickness direction is reduced.

Another aspect of the invention lies in a disk holder including a hole not enabling passage of a head of a bolt able to screw into an internal threaded portion for attaching the disk holder to a disk grinder, but enabling passage of the external  
25 threaded portion of the bolt, a holding surface able to hold by a planar fastener a circular abrasive sheet having a center hole, and a projection for passing through and engaging with the center hole of the held abrasive sheet and further able to prevent detachment of the abrasive sheet, wherein said projection is formed by a metal, said holding surface is formed by a plastic, and said hole is formed in said  
30 projection so that the dimension of the disk holder in the thickness direction is reduced.

Preferably, the hole of said disk holder has an internal threaded portion into which the bolt for attaching the disk holder can screw.

### BRIEF DESCRIPTION OF THE DRAWINGS

5 Fig. 1 is a side sectional view of a disk holder of a first embodiment of the present invention.

Fig. 2 is a partially sectional side view of disassembled parts showing the attachment of the disk holder of Fig. 1 and the disk grinder.

Fig. 3 is a side view of a grinder with the disk holder of Fig. 1 attached.

10 Fig. 4 is a side sectional view of a disk holder of a second embodiment of the present invention.

Fig. 5 is a partially sectional side view of disassembled parts showing the attachment of the disk holder of Fig. 4 and the disk grinder.

Fig. 6 is a side sectional view of a conventional old type of disk holder.

15 Fig. 7 is a side sectional view of a conventional new type of disk holder.

### DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the present invention will be explained below with  
20 reference to the drawings.

First, an explanation will be given of a first embodiment referring to Figs. 1 to 3. Portions common (or able to be common) with the above-mentioned conventional structural portions and parts are given the same reference numerals and overlapping explanations are omitted. The illustrated disk holder I is designed  
25 to be twisted over the shaft (external threaded portion 3) of the disk grinder G shown in Fig. 2 and to spin integrally with the same.

The disk holder 1 exhibits the overall shape of the conventional disk holder shown in Fig. 6 minus the boss portion at the top half and comprises a pad 2 and projection 7. Pad 2 made of polyurethane foam has inverted saucer-shaped holding  
30 surface 5 made of ABS, nylon, polyester, vinyl, or other plastic material. Metal projection 7 of brass, steel, etc. is insert molded at the center of pad 2. It is

understood that the foregoing list of materials for the pad, surface, and insert are by way of example only, and that the present invention is not limited to these materials.

The annular holding surface 9 of the holding surface 5 preferably includes one portion of a releasable hook and loop fastener system or releasable pressure sensitive adhesive fastener system to hold and affix and in a detachable manner the circular abrasive sheet 79 with the center hole 77 through a so-called planar fastener 11. At this time, the projection 7 passes through the center hole 77 of the abrasive sheet 79 and a hook-like portion 13 of the front end of the projection engages with the edge of the hole, therefore the detachment of the abrasive sheet 79 can be further inhibited. While it is preferred that the holding surface 5 and abrasive sheet 79 are circular, it is understood that the holding surface and abrasive sheet can be any other desired shape, such as triangular, square, etc.

In the preferred embodiment, the projection 7 of the disk holder 1 is formed with an internal threaded portion 15 passing through its center. The internal threaded portion 15 is designed to have screwed into it the external threaded portion 3 (shaft) of the disk grinder. It is understood that the invention can include other means for attaching the disk holder 1 to the grinder G.

In a disk holder 1 having the above configuration, since the internal threaded portion 15 for attachment of the disk holder is formed in the projection 7, it is possible to make the dimension in the thickness direction smaller as a whole and therefore easy fitting in the existing compact cover C of the disk grinder G - the previous problem - becomes possible. Further, since the projection itself is formed by insert molding a metal part 7 with the pad 2, there is also no problem in terms of the strength.

Next, an explanation will be made of a second embodiment referring to Figs. 4 and 5. To facilitate understanding of the explanation, just portions different from the above embodiment of Figs. 1 to 3 will be explained. Common (or possibly common) portions and parts are given the same reference numerals. The illustrated disk holder 21 differs from the disk holder 1 of the above embodiment in that it is attachable in an integrally spinnable manner by bolting to the shaft (internal threaded portion) of the other type of disk grinder G' shown in Fig. 5.

The projection 27 of the disk holder 21 is formed passing through its center with a hole 29 which can pass the external threaded portion of the hexagonal socket bolt B envisioned as the bolt and is formed with a countersunk hole 31 able to contain the entire height of the cylindrically shaped head of the hexagonal socket bolt.

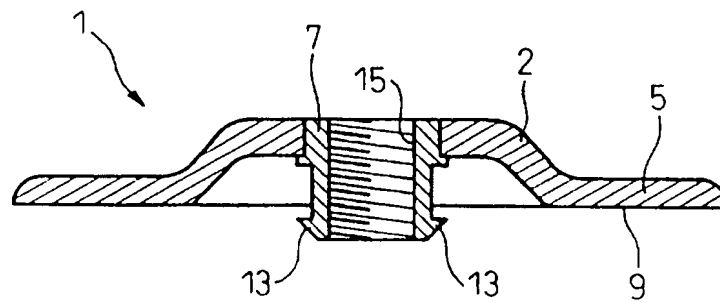
In a disk holder 21 having the above configuration, it is possible to make the dimension in the thickness direction A smaller as a whole in the same way as in the above embodiment and therefore easy fitting in the existing compact cover C of the disk grinder G' is possible. Further, the strength is superior in the same way as above.

Further, instead of making the hole 29 a simple round hole, it is also possible to provide an internal threaded portion (not shown) with which the above-mentioned hexagonal socket bolt B can engage. In this case, the internal threaded portion of the hole, the internal threaded portion of the spinning portion of the disk grinder G', and the external threaded portion of the hexagonal socket bolt B for engaging with the same constitute a so-called double-nut construction. As a result, looseness of the hexagonal socket bolt B is considerably suppressed. This is extremely preferable.

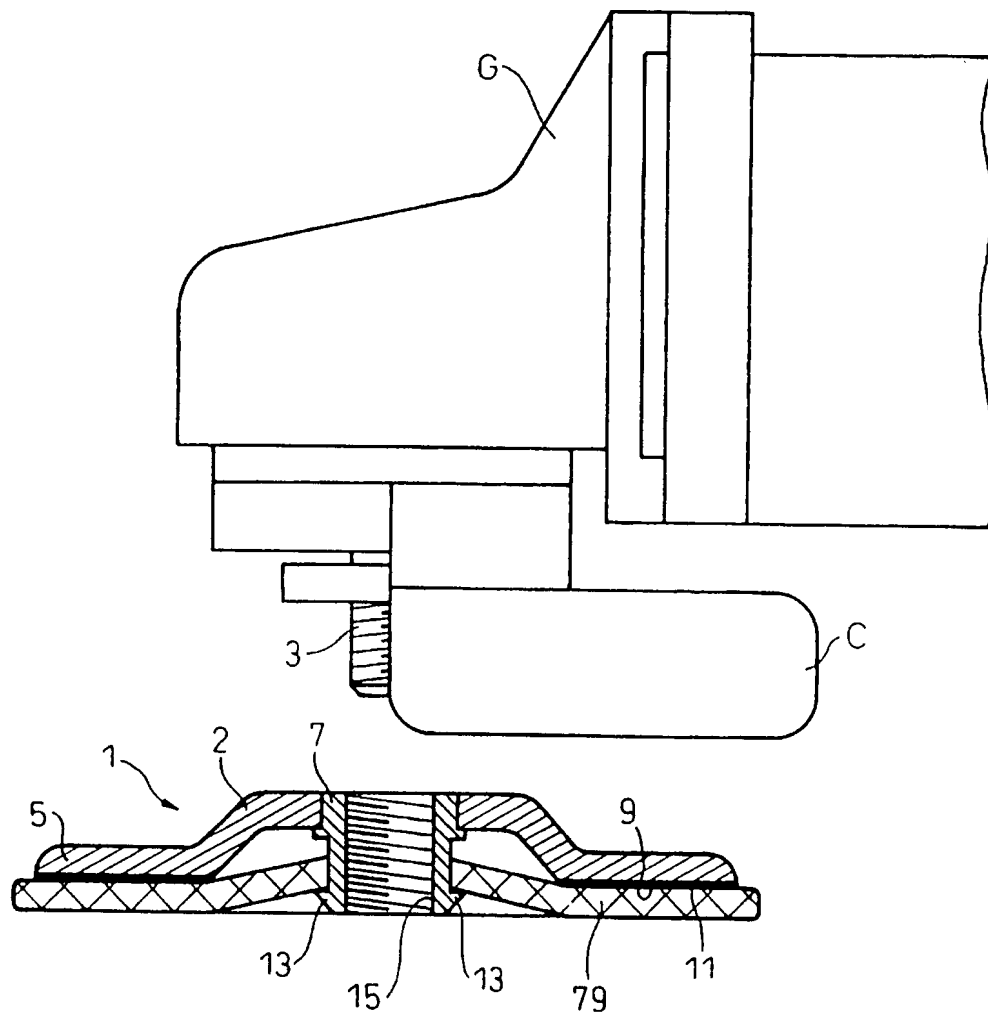
As explained above, according to the present invention, it becomes possible to provide a compact disk holder which is superior in strength and at the same time can be completely fit in existing covers.

## Claims:

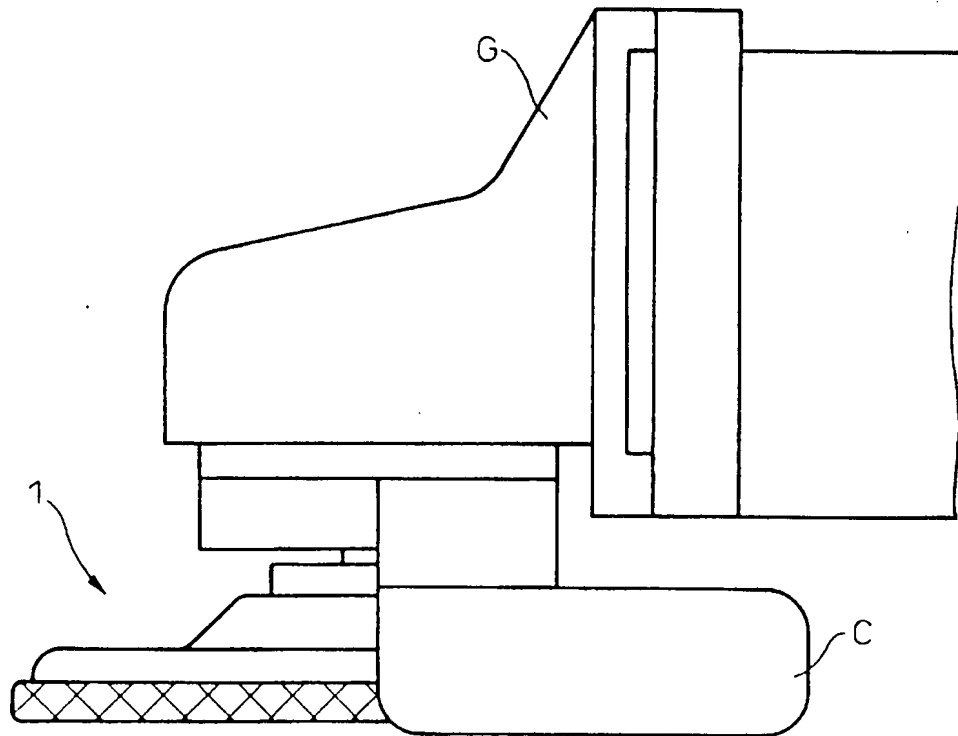
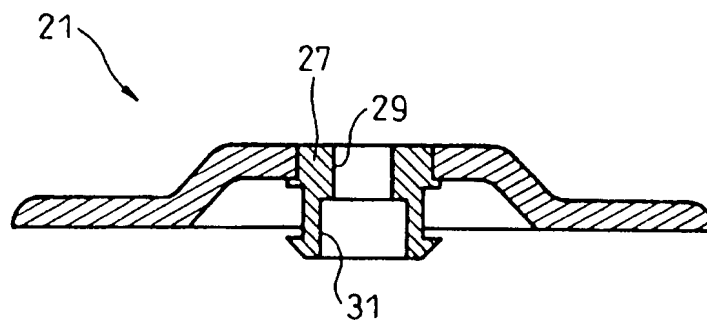
1. A disk holder including  
an internal threaded portion into which can be screwed an external  
5 threaded portion for attaching the disk holder to a disk  
grinder,  
a holding surface able to hold by a planar fastener a circular abrasive  
sheet having a center hole, and  
a projection for passing through and engaging with the center hole of  
10 the held abrasive sheet and further able to prevent  
detachment of the abrasive sheet,  
said disk holder characterized in that said projection is formed by a  
metal, said holding surface is formed by a plastic, and  
said internal threaded portion is formed in said projection so that the  
15 dimension of the disk holder in the thickness direction is  
reduced.
2. A disk holder including  
a hole not enabling passage of a head of a bolt able to screw into an  
20 internal threaded portion for attaching the disk holder to a  
disk grinder, but enabling passage of the external threaded  
portion of the bolt,  
a holding surface able to hold by a planar fastener a circular abrasive  
sheet having a center hole, and a projection for passing  
25 through and engaging with the center hole of the held  
abrasive sheet and further able to prevent detachment of the  
abrasive sheet,  
said disk holder characterized in that said projection is formed by a  
metal, said holding surface is formed by a plastic, and  
30 said hole is formed in said projection so that the dimension of the  
disk holder in the thickness direction is reduced.

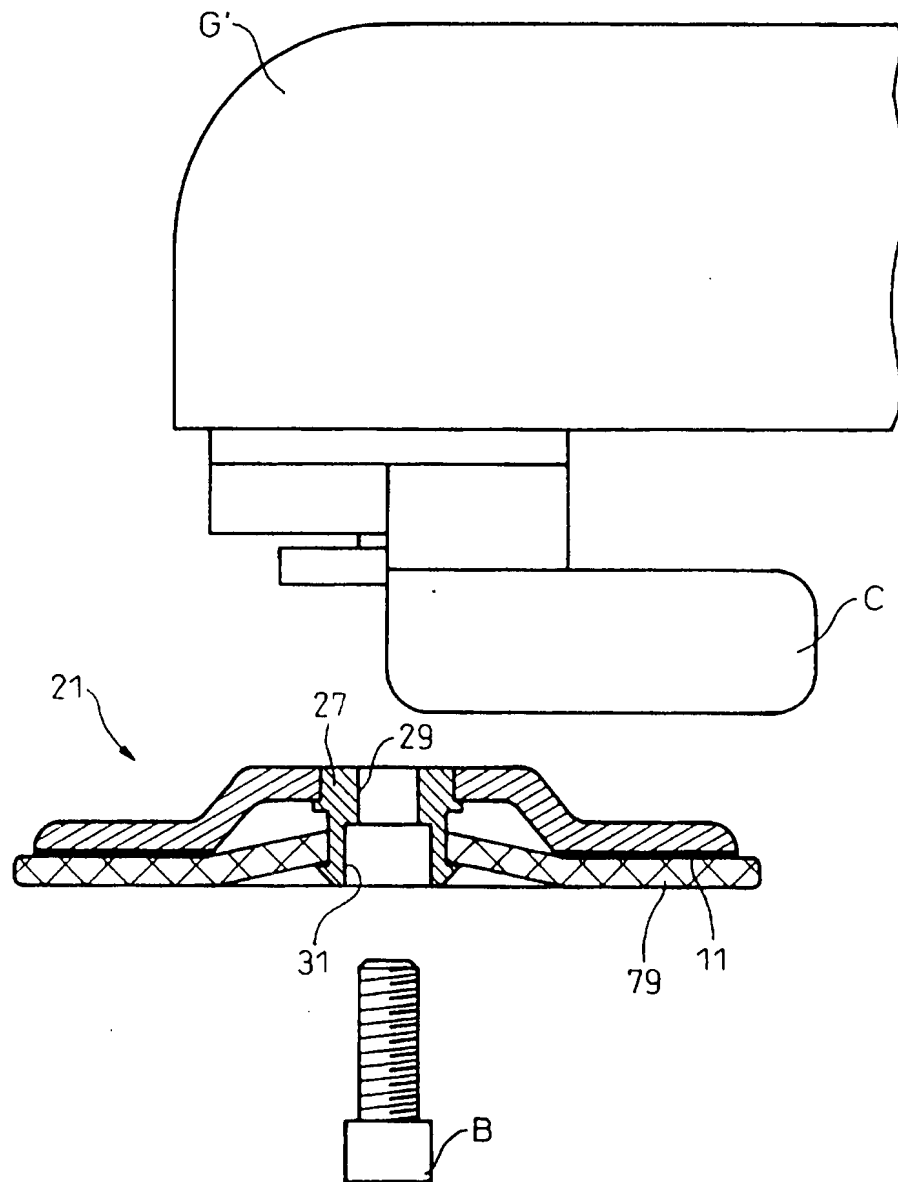
**Fig. 1**

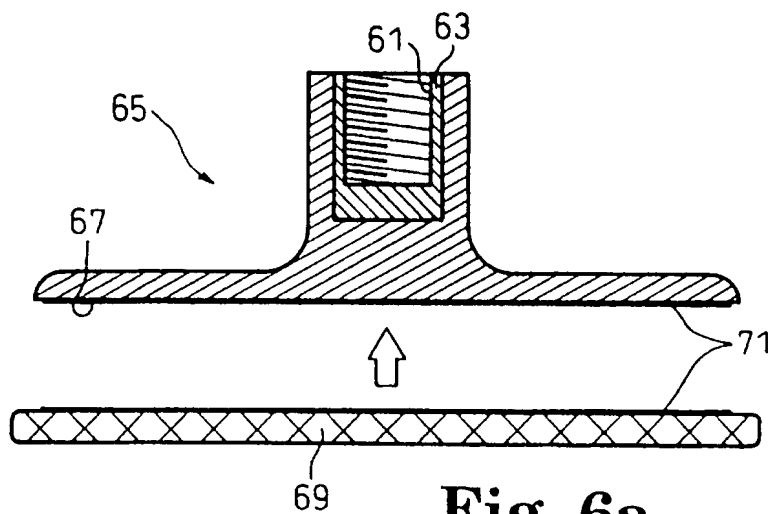




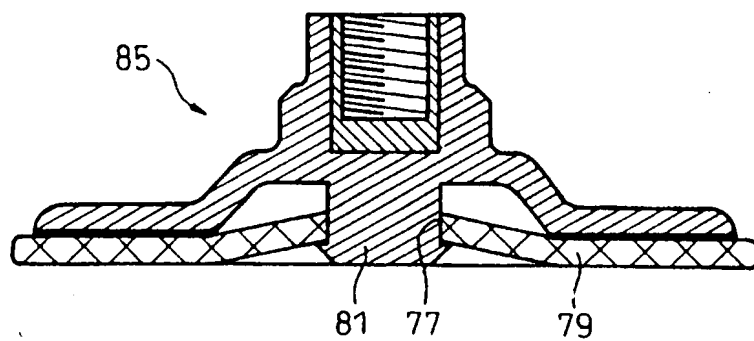
**Fig. 2**

**Fig. 3****Fig. 4**

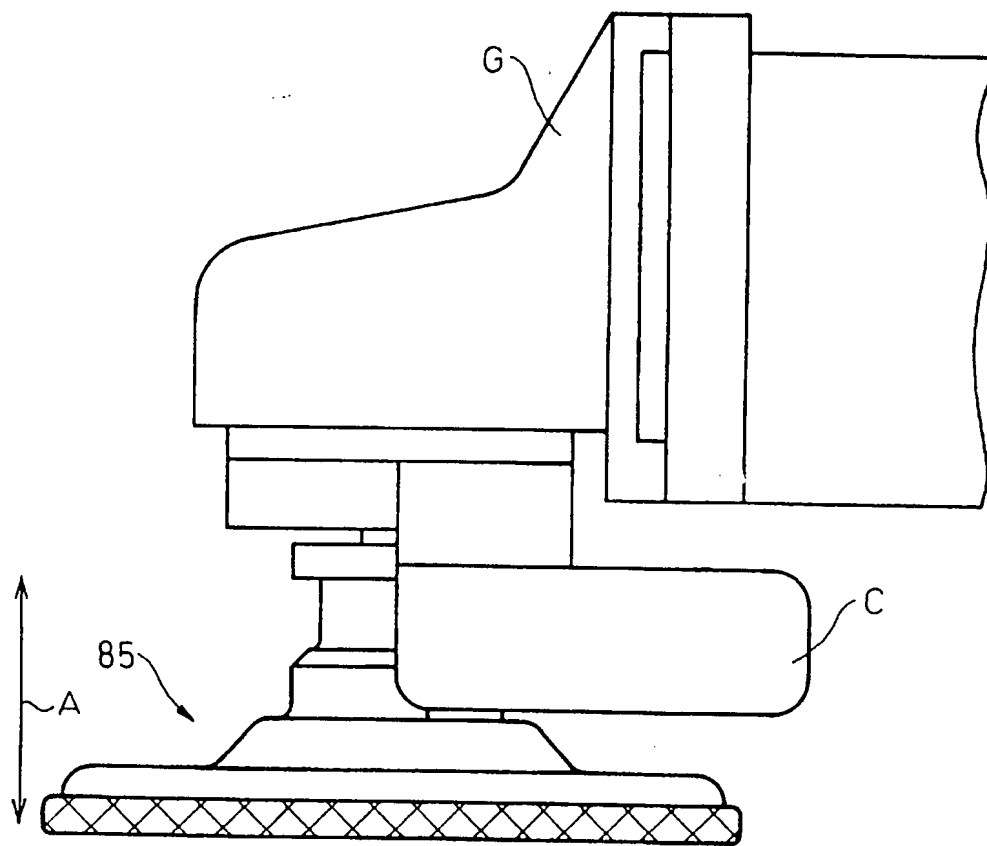
**Fig. 5**



**Fig. 6a**



**Fig. 6b**

**Fig. 7**